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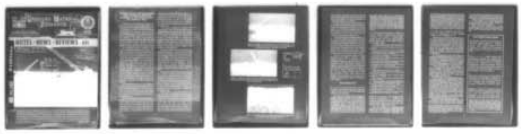

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DREDGED MATERIAL RESEARCH

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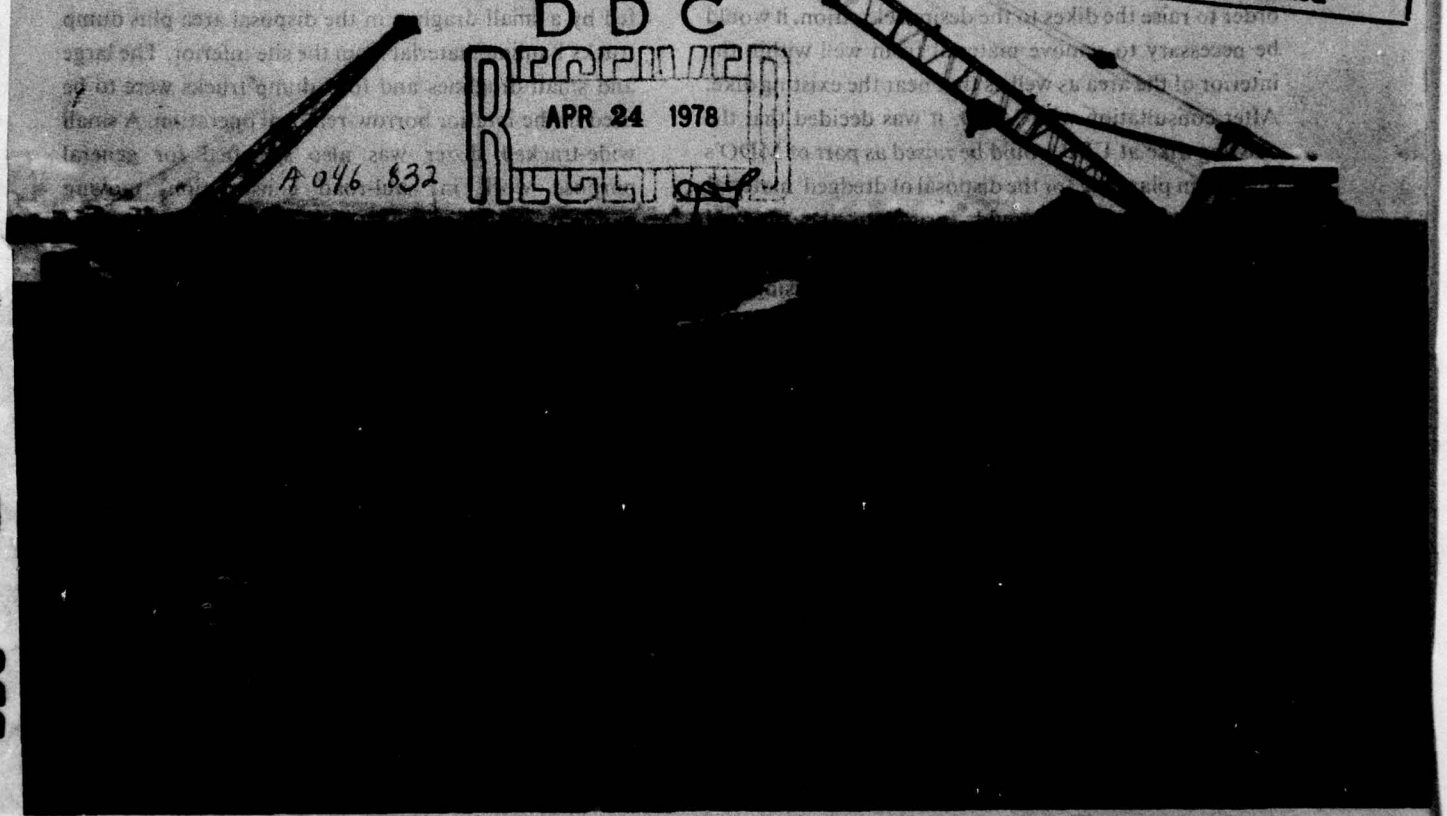

PRODUCTIVE USE OF DREDGED MATERIAL AND EFFECTIVE DISPOSAL AREA MANAGEMENT have been objectives of studies by the Dredged Material Research Program (DMRP). The experimental dewatering program at the Upper Polecat Bay disposal site in Mobile, Alabama (a cooperative effort of the DMRP and the Mobile District) produced large volumes of stable fine-grained material that is being used to raise the perimeter dikes around the disposal site. The combination of borrow mining and dike raising, shown in the above photo and described in the following article, will provide approximately one million cubic metres of additional storage at a cost-effective price of approximately $0.17 per cubic metre of storage gained.

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BORROW MINING AND DIKE RAISING WITH FINE-GRAINED DREDGED MATERIAL AT THE UPPER POLECAT BAY DISPOSAL AREA

In cooperation with the Operations Division of the U. S. Army Engineer District, Mobile (MDO), the Disposal Operations Project (DOP) is conducting full-scale operations for removal of dewatered fine-grained dredged material from the interior of the Upper Polecat Bay (UPB) disposal site in Mobile, Alabama, and using this material in raising perimeter dikes. In the October 1976 edition of this Bulletin, field dewatering experiments being conducted by the DOP at the UPB site were described in detail. The field dewatering program provided successful evaluation of various methods for dewatering fine-grained dredged material.

The experimental program produced a large volume of dewatered dredged material. This dry, more stable soil was found to be suitable for dike raising. In order to raise the dikes to the desired elevation, it would be necessary to remove material from well within the interior of the area as well as that near the existing dike. After consultation with MDO, it was decided that the existing dike at UPB would be raised as part of MDO's long-term planning for the disposal of dredged material and that the DOP would formulate the plan of operation necessary for removing the fine-grained dredged material and conducting the dike-raising and would provide general direction of the work. The MDO would provide major funding for the project and handle contractual and administrative details. Portions of the work would be funded by the DMRP Productive Uses Project, Mr. Thomas R. Patin, Manager, as well as by the DOP.

The existing dike was created by end-dumping sand available from previous disposal operations and was constructed to approximately 4.9 m above surrounding terrain, with a crest width of 3.7 m and approximate 1V-on-1H side slopes. The sand displaced soft foundation soils down to approximately 4.9 m below the surrounding terrain.

After field subsurface exploration and laboratory testing to determine the strength of the foundation soils and the condition of the existing perimeter dike, a dike design was prepared using DMRP-developed concepts for construction of dikes with fine-grained material (see Technical Report D-77-9). Using the stable sand dike as a base section, an inward-benched dike section was designed that would raise the final dike height 2.4 m to an elevation of 7.3 m above the surrounding terrain and would have a 2.4-m crest width and approximate 2V-on-3H side slopes. The dike was to be built in two stages from semicompacted and uncompacted fine-grained dewatered dredged material removed from the disposal area.

Preliminary calculations indicated that approximately 77,000 m^3 of dewatered dredged material would be needed to construct the dike. Approximately 50,000 m^3 of material could be obtained within the range of a dragline operating from the perimeter dike. However, an additional 27,000 m^3 of material was needed from the interior of the site. To obtain this material, the DOP planned to construct filter-cloth-reinforced haul roads into the site and then use small draglines to load dump trucks for transport of the material to the perimeter dike.

Equipment required for the work included a large dragline operating from the perimeter dike and being fed by a small dragline in the disposal area plus dump trucks hauling material from the site interior. The large and small draglines and four dump trucks were to be used in the interior borrow-removal operation. A small wide-tracked dozer was also specified for general purpose work in haul-road construction, moving material, maintaining roads, retrieving immobilized vehicles, and performing other general purpose site work.

Construction operations were initiated in October 1977. The cover photo shows the initial perimeter dragline borrow removal activities at the north end of the disposal site, while Figure 1 is a view, looking along the disposal site inside the perimeter dike, of the result of borrow mining. The interior borrow removal operation is shown in Figure 2, where a dragline working on mats is removing the dewatered fine-grained material crust and loading it into 7.6 m^3 dump trucks for transport to the perimeter dike.

Figure 3 shows a close-up of the haul road. This haul road, constructed by making a pad of dewatered dredged material covered with fabric for reinforcement and overlaid with a combination of sand and shell, has withstood several thousand load repetitions of heavily loaded dump trucks with only minimal rutting. Also, shown in the right of the photograph, the dewatered dredged material has been excavated to the base of the existing crust and the surface of the material adjacent to the haul road will not support the weight of a

Figure 1. Results of the perimeter borrow removal operation at the approximate midpoint of the west perimeter dike. Note the drainage trench left along the perimeter to facilitate site drainage

Figure 2. Dragline on single mats removing dewatered dredged material from disposal site interior for truck transport via filter-cloth-reinforced haul roads to site perimeter

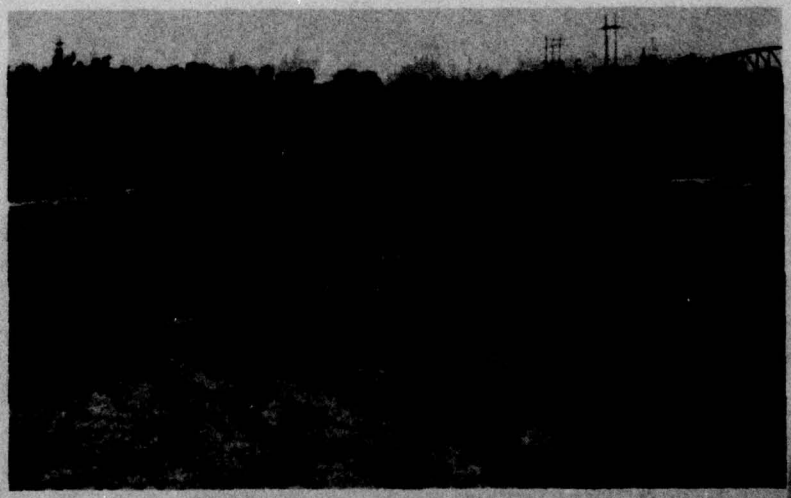

Figure 3. Spur haul road after completion of borrow removal operations. Note absence of side caving and mud waves

person. However, the design of the haul road was such that no side slope failures or mud waves occurred under design traffic loading. The road will ultimately be removed and used as borrow material.

The dike raising will provide approximately one million cubic metres of additional storage in the 14.6-ha site at a unit construction cost of $0.17/m³ of storage gained. Use of dewatered dredged material was approximately 20 percent cheaper than unit cost for constructing the raised dikes with material purchased offsite and transported to the disposal area.

The work is expected to be finished in March 1978. As a result of development and application of DMRP technology, fine-grained dredged material at the UPB site, which for years had the consistency of "warm axle grease," has been successfully dewatered and will have been removed and used productively, providing dike raising more cost-effective than other available alternatives. All work is being documented and a report will be prepared to aid others in using the concepts.

The work is being conducted under the general supervision of Mr. Charles C. Calhoun, Jr., DOP Manager, and Dr. T. A. Haliburton, DMRP Geotechnical Engineering Consultant, and the direct supervision of Mr. Jack Fowler, Research Civil Engineer, on loan to the DMRP from the Waterways Experiment Station's Soils and Pavements Laboratory. The work is being coordinated for MDO by Mr. J. Patrick Langan, Acting Chief, Project Operations Branch, and Mr. Paul J. Warren, Area Engineer. More information on the project may be obtained by contacting Mr. Calhoun, Dr. Haliburton, or Mr. Fowler.

NEW LITERATURE

Jin, J. S., et al., "Leaching Characteristics of Polluted Dredgings," *Journal of the Environmental Engineering Division, ASCE*, Vol 103, No. EE2, Proceedings Paper 12848, Apr 1977, pp 197-215.

This study was directed toward evaluating the pollution potential of leachates from seven different dredged materials and the effect of various additives on improving leachate quality, as well as sedimentation characteristics and shear strength. Based on the results of sequential series of sedimentation tests and sedimentation-leaching tests with and without additives, no significant changes in leachate quality were observed; increases in the specific ion concentrations and increases in the dissolved solids of the leachates were directly attributable to the additives used. In most cases there were increases in the solids due to flocculation, and lime was found to be effective in stabilizing the soil structure, increasing the permeability of the sediment and hastening the rate of leachate production. In an effort to assess the long-term pollution potential of such leachates with and without addition of lime, a series of repeated leaching tests were performed. The leachates from the dredged materials tested do not appear to cause any serious pollution problem.

U. S. Environmental Protection Agency, *Management of Bottom Sediments Containing Toxic Substances; Proceedings of the Second U. S.—Japan Experts' Meeting, October 1976, Tokyo, Japan*, Ecological Research Series, Report No. EPA-600/3-77-083, Jul 1977, Corvallis, Oregon.

Proceedings volume contains the following articles:

"Dredging of Contaminated Bed Sediment in Japan," by T. Sameshima

"Countermeasures for Pollution in Tokyo Bay," by T. Ohtsuka

"An Experiment in Removal of Organically Polluted Bottom Mud from the Seto Inland Sea," by A. Murakami

"The Mechanism of Methylmercury Accumulation in Fish," by M. Fujiki, R. Hiroto, and S. Yamaguchi

"Determination of Trace Amounts of Methylmercury in Sea Water," by H. Egawa and S. Tajima

"Behavior of Heavy Metals and PCBs in Dredging and Treating of Bottom Deposits," by K. Murakami and K. Takeishi

"A Study on the Behavior of Mercury-Contaminated Sediments in Minamata Bay," by T. Yoshida and Y. Ikegaki

"Using Sand Fill to Cover Dredge Spoils Containing Mercury," by S. Fujino

"Chemical Stabilization of Soft Soils," by T. Okumura

"A Method for Disposing of Waste Water at Dredged Material Reclamation Sites," by E. Satoh

"Legal and Administrative Aspects of Bottom Sediment Management," by A. F. Bartsch

"Hydraulic Dredging as a Lake Restoration Technique: Past and Future," by S. A. Peterson

"Interchange of Nutrients and Metals Between Sediments and Water During Dredged Material Disposal in Coastal Waters," by D. J. Baumgartner, D. W. Schults, S. E. Ingle, and D. T. Specht

"Dredging Conditions Influencing the Uptake of Heavy Metals by Organisms," by J. F. Sustar and T. H. Wakeman

"Dredged Material Densification and Treatment of Contaminated Material," by C. C. Calhoun, Jr.

"Ecological Considerations in Site Assessment for Dredging and Spoiling Activities," by D. K. Phelps and A. C. Meyers

Brahme, S. B., and Herbich, J. B., "Dredging in India: Suggested Improvements in Techniques and Equipment," CDS Report No. 204, Jun 1977, Center for Dredging Studies, Dept. of Civil Engineering, Texas A&M University, College Station, Texas.

This study describes the dredging problems encountered in the past few years at several major Indian ports. Site conditions along with their corresponding environmental characteristics are

discussed and related to dredging problems encountered there. Dredging equipment currently being used is also discussed and improvements suggested in the context of existing problems. Special attention is given to dredging problems occurring during the monsoon season since it is during this period that 70% of the siltation occurs. The major improvements in dredging operations and equipment are given in this context. Finally, a brief set of conclusions is offered which summarize the most acute problems and possible solutions at Indian ports.

U. S. Army Corps of Engineers, *1976 Report to Congress on Administration of Ocean Dumping Activities*, Jun 1977, Washington, D. C.

This is the First Annual Ocean Dumping Report to the Congress submitted by the Secretary of the Army. This report, prepared by the Army Corps of Engineers, is submitted as required by Section 2, Public Law 94-326, which amended the Marine Protection, Research and Sanctuaries Act (MPRSA). Three other Federal agencies are also submitting annual ocean dumping reports. They are the Environmental Protection Agency (EPA), the National Oceanic and Atmospheric Administration (NOAA), and the United States Coast Guard (USCG).

The report begins with a review of the Corps ocean dumping responsibilities and authorities. Included is a discussion of (1) the MPRSA's legislative history, (2) the relationship of responsibilities between the Corps and EPA, and (3) the eleven EPA and Corps documents containing Federal regulations and criteria published since the Act became effective on October 23, 1972.

A brief description of the actual dredging and disposal operation is presented in Chapter III. Various types of dredges are explained along with the advantages of each. Emphasis is on the self-loading hopper dredge since it was responsible for 71% of the dredged material disposed of in U. S. ocean waters during Calendar Year (CY) 1976.

A large amount of tabulated basic statistical data is contained in Chapter IV. Congressionally authorized Corps projects accounted for 97.7% of the 65 million cubic yards of dredged material placed off the coasts of the United States in CY 1976. The remaining 2.3% was permitted by the Corps under Authority of Section 103 of the MPRSA. Approximately two-thirds of the Corps CY 1976 Section 103 permits were granted to other Federal, State, and Local government agencies. Private industry was responsible for less than 1% of the total dredged material disposed of in ocean waters. Numerous other statistics are contained in the report, including a complete tabulation of CY 1976 active ocean disposal sites, quantities and project locations.

In Chapter V considerable information is provided concerning the Corps Dredged Material Research Program being conducted under the River and Harbor Act of 1970. This Congressionally authorized research is examining the environmental effects of current disposal practices and is developing ocean disposal alternatives.

Chapter VI discusses the Corps responsive action to the requirements of the recent International Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

Finally, the report concludes with a single legislative suggestion to extend the annual due date of future Corps ocean disposal reports to June 15 of each year.

NEW DMRP PUBLICATIONS

SCS Engineers, "Feasibility of Inland Disposal of Dewatered Dredged Material: A Literature Review," WES Technical Report D-77-33, November 1977, prepared for the Environment Effects Laboratory. (Final Report on Work Unit 3B02.)

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Danek, L. J., et al., "Aquatic Disposal Field Investigations, Ashtabula River Disposal Site, Ohio; Appendix B: Investigation of the Hydraulic Regime and Physical Nature of Bottom Sedimentation," WES Technical Report D-77-42, December 1977, prepared by Nalco Environmental Sciences for the Environmental Effects Laboratory. (Final Report on Work Unit 1A08B.)

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Falco, Pat K., and Cali, Frank J., "Pregermination Requirements and Establishment Techniques for Salt Marsh Plants," WES Miscellaneous Paper D-77-1, September 1977, Environmental Effects Laboratory. (Final Report on Work Unit 4A09.)

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Haliburton, T. Allan, et al., "Feasibility of Pinto Island as a Long-Term Dredged Material Disposal Site," WES Miscellaneous Paper D-77-3, December 1977, Environmental Effects Laboratory. (Final Report on Work Unit 5A16.)

NOTE: Copies of the above reports will be furnished to individual requestors as long as supplies last. Since it is only feasible to print a limited number of copies, requests for single rather than multiple copies by a single office will be appreciated. Please address all requests to the Waterways Experiment Station, ATTN: Ms. D. P. Booth. When supplies are exhausted, copies will be obtainable from the National Technical Information Service, 5205 Port Royal Road, Springfield, VA 22151.

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